

FINAL REPORT

Testing retained sowing seed of hybrid canola over a range of rainfall zones

YCR00001

Project Details

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Summary

Canola hybrids are now available in Australia covering conventional, Clearfield®, triazine[#] tolerant and Roundup Ready® herbicide systems. As growers are used to sowing retained seed from open pollinated crops, they may wish to retain sowing seed harvested from the previous hybrid crop to reduce the up-front cost of sowing a canola crop. Little independent research has evaluated the effect on plant growth, blackleg resistance and grain yield. It is important that growers have credible information as to the effect of retaining hybrid seed in all rainfall zones.

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Recommendations

Results of these trials should be extended to growers and advisers in conjunction with any studies conducted by private breeding companies as all studies have shown similar results.

The oilseeds industry needs to develop a system that will allow an end point royalty on open pollinated canola varieties to be collected and distributed back to the company who developed that open pollinated variety.

Outcomes

In many cases, retained hybrid sowing seed resulted in more blackleg and lower grain yields than when commercial hybrid sowing seed was used. Oil content was lower in crops grown from retained sowing seed. Benefits of commercial hybrid sowing seed outweighed the cost of buying that seed.

Achievement/Benefit

Background

Canola hybrids are now available in Australia covering conventional, Clearfield®, triazine tolerant[#] and Roundup Ready® herbicide systems. As growers are used to sowing retained seed from open pollinated crops, they may wish to retain sowing seed harvested from the previous hybrid crop to reduce the up-front cost of sowing a canola crop. Little independent research has evaluated the effect on plant growth, blackleg resistance and grain yield. It is important that growers have credible information as to the effect of retaining hybrid seed in all rainfall zones.

Objectives

This research program aimed to conduct a series of trials in 2012 to measure the effect of retaining hybrid sowing seed on plant growth, blackleg resistance and grain yield compared to the original hybrid (ie. as purchased from seed supplier; referred to as 'commercial' here after) for a range of herbicide tolerance options in a range of rainfall zones in southern Australia.

Methodology

Replicated trials were conducted at four locations within different rainfall zones in the southern region. Site locations were Minnipa and Lameroo for low rainfall conditions, Bordertown for a medium rainfall site and Bool Lagoon for a high rainfall site. Plot size was 10m long by eight rows and three replicates were sown. Trials were conducted to compare the original hybrid seed with first generation grower retained hybrid seed. Retained hybrid sowing seed was sourced from individual farmers commercial crops from 2011 to reduce the possibility of contamination in samples harvested from small plot yield trials.

Conventional (Hyola 50 plus Taurus at Bool Lagoon), Clearfield® (45Y77, 45Y82, 46Y83 and Hyola 575CL) and triazine[#] tolerant (CB Tumby HT and CB Jardee HT) hybrids were assessed. All seed was graded and assessed for germination to ensure good quality seed was used. Treatments under test were the retained hybrid seed plus and minus a fungicide treatment compared to the original hybrid seed also plus and minus a fungicide treatment. Varieties with the same herbicide tolerance were sown in groups to reduce the risk of damage by herbicides.

Plant vigour, internal blackleg infection, grain yield and oil content were measured.

Other Research

This preliminary work highlights a need for further on-farm research to determine the effect of retaining hybrid sowing seed on plant growth, blackleg resistance and grain yield for the range of herbicide tolerance options over a range of rainfall zones in southern Australia.

Additional Information

Results

This research showed reduction in blackleg resistance in the retained hybrid seed but variable grain yield responses.

Bordertown

Yield (kg/ha)

Type	commercial		retained	
Name	Jockey®#	nil	Jockey®	nil
1	1367	1401	1174	1281
2	1806	2080	1749	1752
3	1615	1566	1583	1372
4	2139	2095	1713	1762
5	1884	1928	1602	1566
6	1504	1406	1676	1421
7	1443	1112	1237	1157

Oil (%)

Type	commercial		retained	
Name	Jockey®	nil	Jockey®	nil
1	41 .9	42.1	40.7	41.1
2	43.4	43.5	42.7	41.9
3	42.2	42	42.5	41.5
4	44.4	44	43.4	42.9
5	44.2	43.6	43.2	43.5
6	39.6	39.6	39.5	38.9
7	40.4	40.6	39.9	40.1

Protein (%)

Type	commercial		retained	
Name	Jockey®	nil	Jockey®	nil
1	40.7	40.2	40.6	40.8
2	38.8	39.7	39.7	40.1
3	40	40.5	39.9	40.3
4	38.9	39.3	38.7	39.6
5	41 .8	42.6	42.3	42.1
6	39.7	39	40.1	39.7
7	39.8	39.1	39.4	39

Glucosinolates (micro/gram meal)

Type	commercial		retained	
Name	Jockey®	nil	Jockey®	nil

1	9	7	7	8
2	6	6	5	7
3	7	7	6	7
4	6	5	6	6
5	8	8	7	7
6	8	7	8	7
7	8	6	7	6

Lameroo Yield (kg/ha)

Yield (kg/ha)

Type	commercial		retained	
Name	Jockey®	nil	Jockey®	nil
1	850	701	701	61 5
2	980	1007	904	794
3	818	865	671	671
4	872	853	740	71 5
5	836	877	630	593
6	791	733	654	657
7	693	738	662	691

Oil (%)

Type	commercial		retained	
Name	Jockey®	nil	Jockey®	nil
1	40	39.6	38.6	38.8
2	41.1	41.1	39.9	39.5
3	40.5	41.3	40.1	39.9
4	41.8	40.7	40.9	40.3
5	40.7	40.7	40.2	39.4
6	38.4	37.9	37.5	37.9
7	38.4	39	38	38.3

Protein (%)

Type	commercial		retained	
Name	Jockey®	nil	Jockey®	nil
1	43.9	44	43.7	44
2	41.3	41.5	42.7	42.4
3	43.8	42.5	44.3	43.5
4	41.5	42.8	42.1	42.8
5	44	44.3	44.4	45
6	42.8	42.3	42.8	42.6
7	43.3	42.8	42.9	42

Glucosinolates (micro/gram meal)

Type	commercial		retained	
Name	Jockey®	nil	Jockey®	nil
1	11	12	11	10
2	8	7	9	8
3	8	8	8	7
4	7	6	8	8
5	10	10	8	10
6	8	8	9	9
7	8	9	7	7

*Bool Lagoon***Yield (kg/ha)**

Type	commercial		retained	
Name	Jockey®	nil	Jockey®	nil
1	2219	2211	2327	1 859
2	21 47	1976	21 89	1 939
3	2209	2333	1888	2253
4	2768	2710	2227	2283
5	2851	2537	2565	2386
6	2481	2314	2478	2278
7	2314	2051	2491	1 908
8	2499	2685	2283	2301

Oil (%)

Type	commercial		retained	
Name	Jockey®	nil	Jockey®	nil
1	46.4	46	45.4	45.1
2	45.8	45.5	44.8	45.1
3	46.3	46.4	45	45.2
4	47.4	47.2	46.8	46.1
5	46.9	46.5	46.5	46.4
6	45	44.8	44.7	43.9
7	44.2	43.9	44.2	44
8	47.5	47	46.4	46.3

Protein (%)

Type	commercial		retained	
Name	Jockey®	nil	Jockey®	nil
1	39.2	39.9	40.1	39.9
2	39	38.8	38.6	38.8
3	38.4	38	39.8	38.9

4	37.4	37.2	37.1	37.3
5	39.9	40	40	39.3
6	39.2	39.4	39.4	39
7	40.3	40	39.9	39.4
8	36.4	36.2	37.1	36.8

Glucosnolates (micro/gram meal)

Type	commercial		retained	
Name	Jockey®	nil	Jockey®	nil
1	4	5	4	4
2	6	6	6	5
3	7	5	5	5
4	5	5	6	6
5	9	7	6	5
6	5	6	7	6
7	6	7	5	5
8	11	11	13	11

Minnipa

Yield (kg/ha)

Type	commercial		retained	
Name	Jockey®	nil	Jockey®	nil
1	417	403	425	448
2	772	705	630	550
3	545	638	455	495
4	692	773	517	628
5	688	708	503	547
6	452	427	433	407
7	362	430	353	392

Mean internal blackleg infection (%)

Lameroo

Treatments	45Y77	45Y82	46Y83	Hyola50	Hyo-la575CL	CB Jardee HT	CB Tumby HT	
com	20.7	12.1	8.4	1.8	5.5	21.8	22.8	
Jockey®	15.9	7.7	6.2	1.7	3.9	16.6	24.1	
nil	25.4	16.5	10.6	2.0	7.1	26.9	21.5	
retained	21.4	27.5	13.1	8.4	4.2	24.1	17.5	
Jockey®	11.8	21.8	10.3	10.0	3.7	18.5	12.3	
nil	31.0	33.2	16.0	6.8	4.7	29.7	22.8	
Grand Total	21.0	19.8	10.8	5.1	4.8	22.9	20.2	

Bool Lagoon

Treatments	45Y77	45Y82	46Y83	Hyola50	Hyo- la575CL	CB Jardee HT	CB Tumby HT	Taurus
com	19.4	17.7	8.7	1.5	4.1	28.5	38.9	3.0
Jockey®	16.4	15.2	8.8	1.4	4.3	22.4	34.9	2.8
nil	22.3	20.3	8.6	1.7	4.0	34.6	42.8	3.3
retained	21.5	22.7	9.1	7.3	4.7	27.8	34.1	4.0
Jockey®	20.3	22.8	6.4	9.2	5.7	30.9	31.2	4.2
nil	22.8	22.7	11.8	5.5	3.7	24.7	37.0	3.8
Grand Total	20.4	20.2	8.9	4.4	4.4	28.1	36.5	3.5

Bordertown

Treatments	45Y77	45Y82	46Y83	Hyola50	Hyo- la575CL	CB Jardee HT	CB Tumby HT	
com	68.5	54.6	46.5	4.8	9.9	87.5	96.8	
Jockey®	59.7	49.1	28.8	7.8	8.8	81.3	97.2	
nil	77.3	60.3	64.3	1.8	10.9	93.7	96.5	
retained	71.8	57.0	60.3	24.6	12.8	86.8	94.9	
Jockey®	67.0	61.2	49.9	33.3	11.6	84.0	93.5	
nil	76.7	52.9	70.7	16.0	14.1	89.6	97.0	
Grand Total	70.2	55.8	53.4	14.7	11.4	87.1	96.0	

Discussion

Implications

Growers would be better off by buying commercial hybrid canola sowing seed rather than retaining their own seed for sowing. As at least one canola breeding company has stated that they intend to only breed and commercially release hybrid canola in future this will limit the potential number of varieties available to growers especially in the lower rain-fall areas where early maturing canola is seen as a potential break crop.

Industry assessment is that at least 45% of the canola sowing seed in Australia in 2013 is retained open pollinated seed. The only way for breeding companies to get a good return on their breeding investment would be to have an end point royalty on all new open pollinated varieties to be released. Nuseed have released two open pollinated triazine tolerant canola varieties for 2014 that have an EPR of \$5 per tonne. A meeting has been recently held between breeding companies and the Australian Oilseeds Federation to begin the process by which an end point royalty system may be established for all open pollinated canola varieties but it will be a long process.

Results

Flowering dates

Very little variation occurred for flowering date between the commercial hybrid and the retained sowing seed with only about one day difference in days to 50% of plants having first flowers.

Early vigour

Some hybrids showed reduced early vigour when sown with retained seed but the response was variable.

Blackleg

Internal infection with blackleg was scored at three sites. A significant interaction between hybrid and seed type occurred at Lameroo and Bordertown with no significance at Bool Lagoon (Table 1). Several hybrids showed increased internal infection when sowing seed was retained.

Table 1. Internal blackleg infection (%) at three sites in 2012

Lameroo							
	45Y77	45Y82	46Y83	Hyola50	Hyo-la575CL	CB Jardee HT	CB Tumby HT
Commercial	20.7 e	12.1 c	8.4 c	1.8 a	5.5 b	21.8 de	22.8de
Retained	21.4 de	27.5 e	13.1 c	8.4 b	4.2 b	24.1 e	17.5 d
Bool Lagoon							
	45Y77	45Y82	46Y83	Hyola50	Hyo-la575CL	CB Jardee HT	CB Tumby HT
Commercial	19.4	17.7	8.7	1.5	4.1	28.5	38.9
Retained	21.5	22.7	9.1	7.3	4.7	27.8	34.1
Bordertown							
	45Y77	45Y82	46Y83	Hyola50	Hyo-la575CL	CB Jardee HT	CB Tumby HT
Commercial	68.5 f	54.6 e	46.5 d	4.8 a	9.9 b	87.5 g	96.8 h
Retained	71.8 f	57 e	60.3 e	24.6 c	12.8 bc	86.8 g	94.9 gh

Note: Within table, values followed by a different letter are significantly different

When hybrid seed was retained Jockey® was needed to be applied to get a similar low level of blackleg as that produced by the commercial hybrid seed, except at Bordertown where very high levels of blackleg occurred (Table 2).

Table 2. Internal blackleg infection (%) affected by seed type and fungicide at three sites in 2012

Treatment	Lameroo		Bordertown		Bool Lagoon	
	Jockey®	Nil	Jockey®	Nil	Jockey®	Nil
Commercial	10.9 a	15.7 b	47.5 a	57.9 b	13.3 a	17.2 b
Retained	12.6 a	20.6 c	57.2 b	57.7 b	16.3 ab	16.5 ab

Note: Within Table, values followed by a different letter are significantly different

Grain yield

Grain yield was significantly higher for commercial over retained hybrid sowing seed at all sites except Bool Lagoon (Table 3), with the greatest percentage yield loss at the two lower rainfall sites of Minnipa and Lameroo. Overall yield loss ranged from 7 to 17% over all hybrids.

Table 3. Mean grain yield (kg/ha) for hybrid sowing seed in 2012

Site	Commercial	Retained	% Commercial
	kg/ha	kg/ha	%
Bool Lagoon	2,394 a	2,228 a	93
Bordertown	1,668 a	1,503 b	90
Lameroo	830 a	693 b	83
Minnipa	572 a	485 b	85

Note: Within Table, values followed by a different letter are significantly different

Table 4. Grain yield of retained hybrid compared to commercial sowing seed for different varieties at all sites (%)

Variety	% Commercial variety
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	Bool Lagoon	Bordertown	Lameroo	Minnipa
1	94	89	85	107
2	100	90	85	80
3	91	93	80	80
4	82	82	84	78
5	92	83	71	75
6	99	106	86	96
7	101	94	95	94
8	88			

Table 5. Grain yield of retained and commercial hybrids as affected by fungicide at all sites 2012

Seed type	Lameroo		Minnipa		Bordertown		Bool Lagoon	
	Fungicide	Nil	Fungicide	Nil	Fungicide	Nil	Fungicide	Nil
Commercial	834 a	825 a	561 a	584 a	1,680 a	1,656 a	2,436 a	2,352 a
Retained	709 b	677 b	474 b	495 b	1,533 a	1,473 b	2,306 a	2,151 b

Note: Within Table, values followed by a different letter are significantly different

Grain quality

Oil content of canola was significantly reduced when retained seed as used at all three sites tested (Table 6). However, protein content was not affected by retaining sowing seed compared to the commercial hybrids and glucosinolate content was only affected by retaining sowing seed at Bool Lagoon and in this case the variation was very minor compared to the acceptable limits for canola quality.

Table 6. Oil content of commercial and retained hybrids in 2012

Site	Commercial	Retained
	Oil %	Oil %
Bool Lagoon	46.0 a	45.4 b
Bordertown	42.3 a	41.6 b
Lameroo	40.1 a	39.2 b

Note: Within Table, values followed by a different letter are significantly different

Financial returns from using retained hybrid sowing seed compared to commercial hybrid seed

Relative financial returns were calculated based on a price per tonne of \$600. Oil content calculated at the normal contract basis resulted in the grain from the commercial hybrid producing a premium of about \$6 per tonne over the retained grain. Likewise the cost of preparing retained sowing seed ready for sowing was calculated at \$6 per hectare, graded, treated with fungicide and bagged. As can be seen from Table 7, the use of commercial hybrid sowing seed gave a good financial return over the use of retained hybrid seed for most hybrids at most sites. Using a price of \$26 per kg for hybrid seed and a sowing rate of 2.5 kg/ha the difference in returns of over \$65 per hectare produces a benefit to using commercial seed. Oil content premium and grading and fungicide cost reduced this threshold by \$12 per hectare and \$18 per hectare when grain yield could be expected to be 1 and 2 t/ha, respectively.

Table 7. Difference in \$ return from commercial and retained hybrid sowing seed for each variety at all four sites in 2012

Variety	Increased \$ return per ha of using commercial over
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	retained hybrid sowing seed (@ \$600 per tonne)			
	Bool Lagoon	Bordertown	Lameroo	Minnipa
1	73	94	71	-16
2	-1	115	87	89
3	120	68	102	70
4	290	228	81	96
5	131	193	147	104
6	12	-56	64	11
7	-10	49	24	14
8	180			

Discussion of Results

In many cases higher grain yields and reduced impact of blackleg occurred when commercial hybrid sowing seed was used rather than retained sowing seed. As well, the commercial sowing seed produced a higher oil content than from crops grown with retained seed. Benefits of commercial hybrid sowing seed outweighed the cost of buying that seed. Differences between hybrids are likely to be caused by the hybrid breeding system being used by the different companies and the degree of heterosis between parental lines that are used to produce each hybrid.

Similar results have been shown in recent studies in Canada where a yield reduction of up to 13% has been shown for retained hybrid canola seed.